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Report on a Small Collection of Fishes from the Wologizi Mountains of Liberia, West Africa, with a Description of Two New Species of *Barbus* (Ostariophysi: Cyprinidae)

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INTRODUCTION

The freshwater fish fauna of Liberia has recently been reviewed by Paugy et al. (in press), who presented an annotated checklist with distributional data for all species recorded from the region. Despite that useful summary, and a number of early papers based on Liberian collections (e.g., Hubrecht, 1881; Steindachner, 1895, and more recently, Schultz, 1942), the Liberian ichthyofauna remains poorly known. This is particularly true of the fishes of the highland drainages, which are sparse in collections.

ACKNOWLEDGMENTS

I am most grateful to Bob W. Dickerman and C. Gregory Schmitt who so kindly agreed to add fishes to an already busy collecting itinerary during their recent ornithological exploration of the mountains of northeastern

Recently a small collection of fishes from the Wologizi Mountains of northeastern Liberia has become available for study and, in view of the general paucity of material from this region, a short report on the collection is presented here. Included among the material, are three new species of the cyprinid genus, *Barbus* Cuvier and Cloquet, 1816, two of which are described below.

Liberia (National Geographic Society Grant 4250-90).

Guy Teugels kindly identified the clariid catfishes in the collection, and Gordon Howes and Christian Lévêque provided generous help with many problems of cyprinid taxonomy.

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Clara Lizana and Norma Feinberg provided much assistance during the preparation of this paper and I am grateful to them both. I would also like to thank Pat Wynn for her beautiful drawings of the two *Barbus* holotypes.

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MATERIALS

The collection was made on March 24th, 1990 by R. W. Dickerman and C. G. Schmitt in the Via River (St. Paul's River drainage), 3 km east, 11 km north of the town of Ziggida, Loffa County, Western Province, Liberia (8°08'N, 9°28'W). Unless stated otherwise, all fish were seined from clear, shallow water (ca. 1 m depth) in a stream immediately above a small waterfall 2 m high. The stream bottom was of coarse sand with no exposed bedrock or rubble. The elevation of the site was 560 m and the water temperature was 75°F at 1839 hours.

SPECIES DESCRIPTIONS

In their introduction to a checklist of the African Cyprinidae, Lévêque and Daget (1984) pointed out that the generic designation, *Barbus*, should, strictly speaking, be restricted to European and certain of the North African species presently assigned to the genus. Howes (1987) concurred with that opinion and provides a provisional definition of *Barbus* sensu stricto, listing 20 species which, together with *Barbus barbus* (Linnaeus, 1758), form a phylogenetically cohesive grouping. The remaining 300+ African species not embraced by Howes' (1987) *Barbus* (sensu stricto) are referred to as "*Barbus*" or *Barbus* sensu lato. It is in this broad sense that the designation *Barbus* is used throughout this paper.

The tropical African *Barbus* residue is clearly a phylogenetically heterogeneous assemblage. In the absence of a thorough morphological analysis, little may be said regarding the precise phylogenetic intrarelationships of this complex group. With respect to the West African representatives of the genus,

Lévêque (in press) has compiled an extremely useful species synopsis with a full key to all described species. Much useful comparative data is also available in a series of recent papers on West African *Barbus* species (e.g., Hopson and Hopson, 1965; Lévêque and Paugy, 1982; Lévêque, 1983, 1989a, 1989b; Lévêque et al., 1987, 1988).

Lévêque (1989a, 1989b) and Lévêque et al. (1987) provided an excellent discussion of the methods and terminology of *Barbus* taxonomy. To facilitate comparison with other West African species I have adhered to their definitions for all counts and measurements (see Lévêque et al., 1987).

Abbreviations:

LS	standard length
H	body depth
LT	head length
IT	head width
DO	eye diameter
Lm	snout length
EI	interorbital width
Ba	length of anterior barbel
Bp	length of posterior barbel
LD	length of longest dorsal fin ray
LP	pectoral fin length
LPC	caudal peduncle length
HPC	caudal peduncle width
ELL	longitudinal scale row (including 1 or 2 scales on caudal fin)
LL-D	scale rows between longitudinal row and origin of dorsal fin
LL-V	scale rows between longitudinal row and the venter
LL-P	scale rows between longitudinal row and pelvic fin base
EPC	scales around the caudal peduncle
GR	gill raker number (rakers on the lower limb of the first arch)
D	number of spines (Roman numerals) and rays (Arabic numerals) in the dorsal fin
A	number of spines (Roman numerals) and rays (Arabic numerals) in the anal fin
Pct	number of unbranched (Roman numerals) and branched rays (Arabic numerals) in the pectoral fin
Pelv	number of unbranched (Roman numerals) and branched rays (Arabic numerals) in the pelvic fin

TABLE 1
Barbus carcharhinoides, Morphometric Measurements
(value for holotype, followed in parentheses by ranges for six paratypes)

LS (mm)	78.6 (28.6–81.3)	IT (%LT)	52.3 (52.1–53.6)
H (%LS)	27.1 (26.1–26.9)	DO (%LT)	27.3 (27.0–28.1)
LT (%LS)	26.9 (26.6–27.5)	Ba (%LT)	20.8 (20.6–21.9)
IT (%LS)	14.1 (14.1–14.8)	Bp (%LT)	30.2 (30.0–31.7)
LPC (%LS)	23.4 (23.6–23.8)	Lm (%LT)	30.2 (30.2–31.7)
HPC (%LS)	11.3 (11.2–11.8)	EI (%LT)	25.5 (25.2–26.3)
LP (%LS)	20.1 (19.9–20.3)	LPC (%LT)	86.7 (85.7–87.0)
LD (%LS)	32.6 (32.4–34.2)	HPC (%LT)	41.9 (40.6–44.0)
Meristic Counts			
ELL	28 (28–29)	RDT	1.14 (1.14–1.26)
LL-D	4.5	D	IV 8
LL-V	3.5	A	III 5
LL-P	2.5	Pct	I 14
EPC	12	Pelv	I 7
Ba	I	GR	2–3
Bp	III	Vt	16 + 17

Vt vertebral counts (abdominal including first four centra comprising the cyprinid Weberian apparatus) + caudal (including urostylar complex)

RDT mean value for the distance between the center of the 2nd and 3rd spot divided by the distance between the center of the 1st and 2nd spot

FAMILY CYPRINIDAE

Barbus carcharhinoides, new species

HOLOTYPE: American Museum of Natural History (AMNH) 59186, male, 78.6 mm SL.

PARATYPES: AMNH 59076, six specimens 28.6–81.3 mm SL.

DIAGNOSIS: *Barbus carcharhinoides* is readily distinguished from most other West African species by the presence of serrations on the posterior margin of the last unbranched dorsal fin ray (figs. 1, 2). It differs from the three other West African species with dorsal fin serrations (*Barbus cadenati* Daget, 1962, *Barbus guineensis* Pellegrin, 1913, and *Barbus dialonensis* Daget, 1962), in possessing four, rather than three, unbranched spinous rays in the dorsal fin, the length of the dorsal fin, and in the presence of an elongate first infraorbital element (= lachrymal). The remaining infraorbital elements are unexpanded (fig. 3).

DESCRIPTION: Based on the holotype and

six paratypes. Morphometric measurements and meristic counts are given in table 1. See also figure 1.

The body of *Barbus carcharhinoides* is moderately compressed and attenuate. The predorsal body depth is relatively high, but tapers sharply behind the dorsal fin spines lending a somewhat sway-backed appearance to the body of the fish. The caudal peduncle is extremely elongate (LPC/LT 85–87%). The snout is bluntly pointed in profile, and the subterminally positioned mouth is moderate in size. Both pairs of barbels are relatively short: the anterior barbels extend only to the anterior margin of the orbit, and the posterior pair extend to the posterior border of the pupil. Cephalic pit lines are well developed and present in a series of rows on the cheek, and on the dorsal surface of the head between the orbits.

The pectoral fins are long and the tips overlap the origin of the pelvic fins. The prominent dorsal fin is considerably longer than the head and is composed of four unbranched spinous rays and eight branched rays. The last unbranched spinous ray is strongly ossified basally with a serrated posterior border and weakly segmented tip (fig. 2). The dorsal fin is expansive with a strongly falcate posterior margin. The anal fin bears three unbranched spinous rays and five branched rays. The caudal fin is strongly forked with pointed lobes.

The body is covered with large regularly

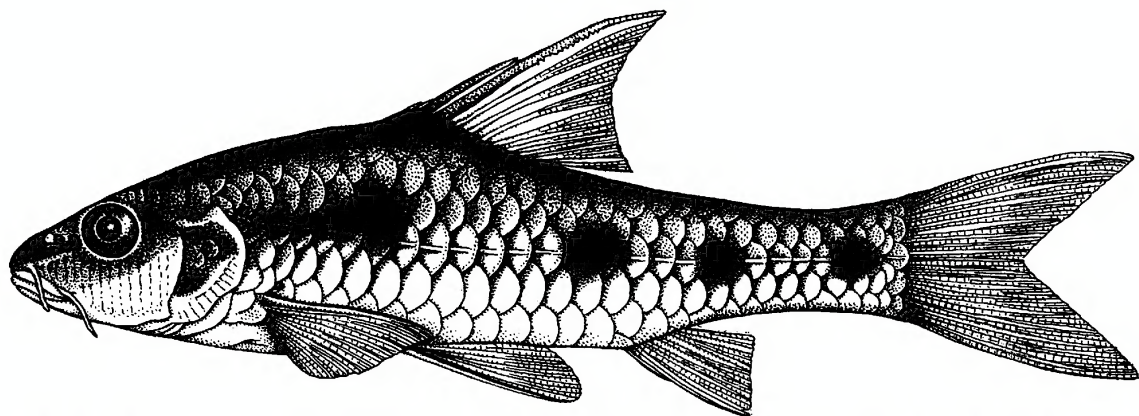


Fig. 1. Lateral view of the holotype of *Barbus carcharhinoides* n. sp. (AMNH 59186). Drawn by Patricia Wynn.

imbricate cycloid scales. Striations on the scales are few in number and diverge from the central focus of each scale. Predorsal scales range between 9 and 10 scales along the midline. There are 28 or 29 scales in the longitudinal series, and the lateral line is more or less straight along the longitudinal series. Additional scale counts are given in table 1.

Gill rakers are weakly developed on the first gill arch. There are two or three small,

nublike rakers on the ceratobranchial, one in the angle of the arch, and one on the epibranchial.

All specimens have a vertebral formula of 16 abdominal and 17 caudal elements. The first infraorbital (= lachrymal) is elongate, but the remaining series is unexpanded (fig. 3). The pharyngeal bone is robust with an invariant tooth formula of 5-3-2:2-3-5.

The holotype and largest paratype (81.3 mm LS) are both sexually mature individuals with enlarged gonads.

COLORATION: In preserved specimens the dorsal body surface is darkly pigmented. Each scale bears numerous fine melanophores that are somewhat less densely scattered peripherally leaving a narrow paler zone at each scale margin. The lateral line scale pockets are marked with a dark, crescentic patch bisected horizontally by the lateral line pore. The dorsum of the head, the dorsolateral aspect of the snout, the upper jaw, and infraorbital region are also darkly pigmented. Three circular, black, midlateral spots are present. The first lies a little above the lateral line canals of the 6th and 7th scales. The second spot overlies the canals of the 14th and 15th lateral line scales, a little behind the vertical through the insertion of the last dorsal fin ray. A third spot is invariably present at the base of the caudal peduncle. In most individuals a fourth, smaller spot is also present between the second and third spots. This additional spot is not always present on both sides of the fish. The dorsal, caudal, and pectoral fins are slightly pigmented and a dusky

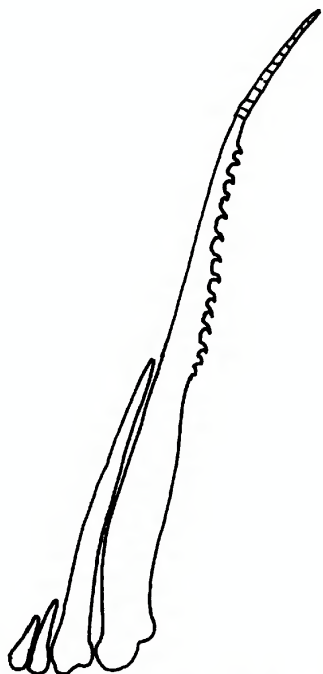


Fig. 2. Spinous dorsal rays of *Barbus carcharhinoides* (AMNH 59076).

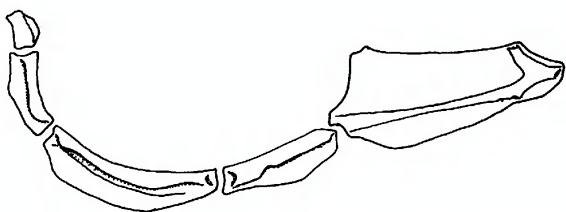


Fig. 3. Infraorbital elements of *Barbus carcharinoides* (AMNH 59076).

gray in color, while the pelvic and anal fins are clear. Juvenile specimens lack much of the dorsal pigmentation of the adults.

Based on color photographs of freshly preserved material, *Barbus carcharinoides* is silvery in life. The dorsum is a dark greenish brown, the midlateral spots are jet black, and the venter is silvery white. The fins are clear with a pale greenish yellow tinge.

DISTRIBUTION: Known only from the type locality.

ETYMOLOGY: Name refers to the species' large and strongly falcate dorsal fin that lends a sharklike appearance to the fish.

RELATIONSHIPS: Because all three possess a serrated last unbranched dorsal fin ray, Lévêque (in press) suggested that the West African species *Barbus cadenati*, *Barbus guineensis*, and *Barbus dialonensis* are closely related. On the basis of this character, *Barbus carcharinoides* would certainly be included among that group. However, although restricted in West African species, dorsal fin serration is not uncommon among *Barbus* species elsewhere (see, e.g., Boulenger, 1911),

and in the absence of a more thorough analysis I am hesitant to align these taxa in any formal way.

***Barbus melanotaenia*, new species**

HOLOTYPE: AMNH 59187, female, 38.9 mm SL.

PARATYPES: AMNH 59075, nine specimens, 30.4–37.2 mm SL.

DIAGNOSIS: *Barbus melanotaenia* is readily distinguished from other *Barbus* species by the possession of a wide, ribbonlike black lateral band extending from the snout to the base of the caudal peduncle (fig. 4).

DESCRIPTION: Based on the holotype and nine paratypes. Morphometric measurements and meristic counts are given in table 2. See also figure 4.

Barbus melanotaenia is a moderately robust, short-bodied species. The predorsal profile is smoothly rounded to the origin of the first spinous dorsal ray. The snout is short and blunt, with a small subterminal mouth. Both pairs of barbels are moderately long; the anterior pair reach to the center of the eye, and the posterior pair extend to the preopercular border. Cephalic pits are poorly developed and barely visible on the cheek and head surface. The eyes are relatively large.

The pectoral fins are large and broad and usually overlap the origin of the large pelvic fins. The dorsal fin is composed of four unbranched spinous rays and eight branched rays. The first dorsal spinous ray is rudimentary and visible only in radiographed or

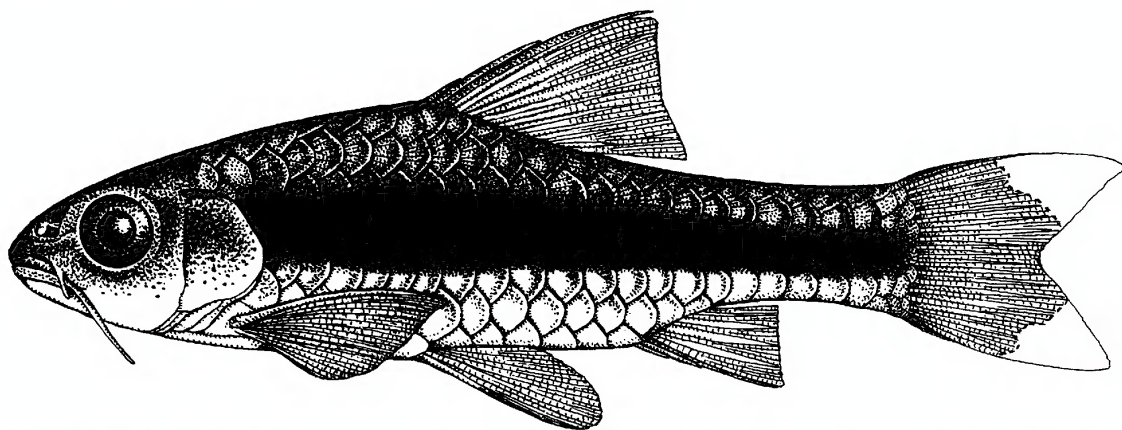


Fig. 4. Lateral view of the holotype of *Barbus melanotaenia* n. sp. (AMNH 59187). Drawn by Patricia Wynn.

TABLE 2
Barbus melanotaenia, Morphometric Measurements
(value for holotype, followed in parentheses by ranges for nine paratypes)

LS (mm)	38.9 (30.4–38.4)	IT (%LT)	65.7 (57.1–63.5)
H (%LS)	28.8 (27.4–27.9)	DO (%LT)	36.9 (31.8–35.5)
LT (%LS)	28.5 (28.2–28.6)	Ba (%LT)	35.1 (34.5–37.1)
IT (%LS)	18.7 (16.3–18.2)	Bp (%LT)	41.4 (43.8–45.1)
LPC (%LS)	20.3 (20.2–21.6)	Lm (%LT)	33.3 (30.5–32.9)
HPC (%LS)	12.6 (11.6–13.2)	EI (%LT)	29.7 (30.1–31.1)
LP (%LS)	23.1 (22.6–23.4)	LPC (%LT)	71.2 (71.4–76.6)
LD (%LS)	28.0 (27.9–28.6)	HPC (%LT)	44.1 (41.1–46.5)
Meristic Counts			
ELL	25 (22–25)	D	IV 8
LL-D	3.5	A	III 5
LL-V	3.5	Pct	I 14
LL-P	2.5	Pelv	I 7
EPC	9	GR	3
Ba	II	Vt	16 + 16
Bp	IV		

cleared and stained material. The last unbranched spinous ray is the longest in the fin, it is flexible and unserrated posteriorly, and shorter than the length of the head. The posterior dorsal fin margin is straight to slightly falcate. The anal fin is relatively long and bears three unbranched spinous rays and five branched rays. The caudal fin is strongly forked with pointed lobes.

The body is covered with large regularly imbricate cycloid scales. Striations on the scale are few in number and diverge from the central focus of each scale. The predorsal scale counts range between 8 and 9 scales along the midline. There are 22–25 scales in the longitudinal series. The lateral line is complete and more or less straight, although in a few individuals it dips to a maximum of slightly less than half a scale row below the horizontal myoseptum in the anterior third of the body. Additional scale counts are given in table 2.

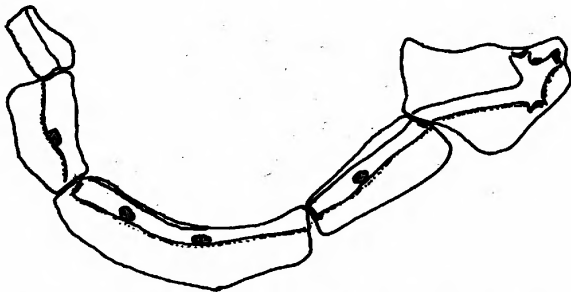


Fig. 5. Infraorbital elements of *Barbus melanotaenia* (AMNH 59075).

Gill rakers are weakly developed on the first gill arch. There are three small, nublike rakers on the ceratobranchial, one in the angle of the arch, and two on the epibranchial element.

All specimens have a vertebral formula of 16 abdominal and 16 caudal elements. The infraorbital series is slightly expanded, with a relatively elongate first infraorbital element (= lachrymal) (fig. 5). The pharyngeal bone is a gracile element with an invariant tooth formula of 5-3-2:2-3-5.

The holotype, and largest known specimen (38.9 mm LS), is a mature female with enlarged ovaries although egg development is not advanced in this individual.

COLORATION: In preserved specimens the dorsal body surface is darkly pigmented. The dorsum of the head and dorsolateral surface of the snout, the upper jaw, anterior barbel, infraorbital series, and operculum are brownish black. A broad, jet black ribbonlike band extends from behind the operculum to the base of the caudal peduncle. The venter is pale and slightly yellowish. All fins are slightly pigmented and dusky gray in color.

Based on color photographs of freshly preserved material, *Barbus melanotaenia* is a strikingly colored fish. It is yellowish brown on the dorsum, and the dominant deep lateral band is jet black. The black band extends onto the operculum, infraorbital series, and upper jaw around the snout. The venter is silvery white. The leading edge of the dorsal

fin, and the pectoral fin are yellowish. The remaining fins are a dusky white.

DISTRIBUTION: Known only from the type locality.

ETYMOLOGY: Name refers to the broad, ribbonlike black lateral stripe that characterizes the species.

RELATIONSHIPS: In overall phenetic similarity and meristic features, *Barbus melano-taenia* is most similar to *Barbus punctitaeniat* Daget, 1954, a relatively widespread species known from the Middle Niger, Upper Volta, the Chad basin, Ghana, and coastal rivers of the Ivory Coast (Hopson and Hopson, 1965; Lévêque, in press). *Barbus melano-taenia* is readily distinguished from *Barbus punctitaeniat* by its unique color pattern, characterized by the presence of a broad, ribbonlike lateral band. In *Barbus punctitaeniat* a narrow midlateral band runs from the tip of the snout to the base of the caudal peduncle. However, a detailed morphological analysis would be necessary to determine whether the phenetic similarity of these two species reflects a close phylogenetic relationship.

Barbus lauzannei Lévêque and
Paugy, 1982

Thirty-seven individuals (AMNH 59073, 29.0–48.8 mm LS) were collected at the Via River locality. They accord well with the description of *Barbus lauzannei* given by Lévêque and Paugy (1982), although some differences in meristic counts are apparent. For example, the vertebral counts recorded for the type series are 32(3), 33(6), and 34(1), while in 15 of the Via River fish the counts are 34(12), and 35(3).² Interestingly, *Barbus lauzannei* shows an elevation in abdominal vertebral numbers (19–20 versus 16 in most other small species of *Barbus* examined).

A slight elevation in the lateral line scale count range is also evident. Lévêque and Paugy (1982) recorded counts of 27(5), 28(4), and 29(5) for the type series, while counts for 15

specimens of the Via River population are 27(2), 28(7), 29(4), 30(1), and 31(1). In other respects the Via River population falls well within the variational range outlined by Lévêque and Paugy (1982). The scale formula for the Via River populations is: (4.5)5.5/27–29/4.5;3;12.

Prior to this collection, *Barbus lauzannei* was known only from the type locality, “Rivière Loffa, au pont de la route reliant Macenta à Nzérékoré,” Guinea.

Barbus species A

Forty-seven specimens (AMNH 59074, 21.0–47.6 mm SL) of an undescribed *Barbus* species were collected at the Via River locality. This species is close to *Barbus eburneensis* Poll, 1941, but differs in a number of meristic and osteological features.

The species is currently being described by C. Lévêque (ORSTOM, Muséum National d’Histoire Naturelle, Paris) on the basis of a collection from Mount Nimba, Guinea, where it occurs in sympatry with *Barbus eburneensis* (Lévêque, personal commun.).

Barbus sacratus Daget, 1963

One large individual and 20 juveniles (AMNH 59181, 19.2–212.5 mm LS) were collected at the Via River locality. *Barbus sacratus* exhibits a considerable amount of interpopulational variation in body depth, barbel development, and degree of development of lobed lips (Lévêque, in press). In common with other Liberian populations, the Via River fish exhibit little lip hypertrophy and no mental lobe is present. The anterior barbels are short, particularly in the juveniles, reaching only to the level of the anterior border of the eye. The posterior barbels are relatively long, extending a little beyond the level of the posterior margin of the orbit. All fish are gracile with H/LS values ranging between 26 and 28 percent. Vertebral counts are 40 or 41 (19 + 21, 19 + 22). In all meristic counts the Via River population falls well within the range for the species (Lévêque, 1990). The scale formula for the Via River population is: 3.5/25–29/3.5;2.5;12.

Barbus sacratus is an Upper Guinean Province species (sensu Roberts, 1975), with a distribution limited to certain coastal rivers

² In their description of *Barbus lauzannei*, Lévêque and Paugy (1982) included only three vertebrae as comprising the Weberian apparatus in cyprinid fish. For ease of comparison, I have retotaled the vertebral counts for the type series to include four modified anterior abdominal vertebrae in the Weberian complex.

from the Tominé in the Fouta Djallon of Guinea to the east of Liberia (Lévêque, 1990).

Labeo alluaudi Pellegrin, 1908

See Lévêque and Daget (1984) for a full synonymy.

Nine specimens were collected from the Via River locality (AMNH 59182, 85.0–130.5 mm LS). They were seined from a small pool (ca. 1.5 m deep) immediately below the waterfall. The pool had a coarse, sandy bottom with scattered boulders exposed (C. B. Schmitt, personal commun.).

These specimens accord well with the redescription of *Labeo alluaudi* given by Reid, 1985. They have a distinctly *Garra*-like appearance and are readily distinguished from *Labeo obscurus* Pellegrin, 1908, and *Labeo parvus* Boulenger, 1902—the two other *Labeo forskalii* group species recorded from the region (see Paugy et al., in press)—by the presence of 16 versus 12 scales around the caudal peduncle.

In Reid's (1985) description of the pigmentation patterning in *L. alluaudi* he found no trace of a dark lateral band in this species. However, the Via River population does display a slight lateral banding, particularly along the caudal peduncle.

Labeo alluaudi is previously recorded only from the Cavally, Cess, and Bagwe River drainages (Paugy et al., in press).

FAMILY CLARIIDAE

Clarias laeviceps laeviceps

Gill, 1862

See Teugels (1986b) for a full synonymy.

Two specimens (AMNH 59065, 188.5–223.0 mm LS) were collected at the Via River locality. They accord well with the redescription of the species given by Teugels (1986a).

Clarias laeviceps laeviceps has been reported previously from the St. Paul River drainage from which the species extends eastward to the Volta River in Ghana (Teugels, 1986a), but is absent in the so-called "Baoulé-V," a savannah area in the Ivory Coast (see Howes and Teugels, 1989).

FAMILY CYPRINODONTIDAE

Aplocheilichthys nimbaensis

(Daget, 1948)

See Wildekamp et al. (1986) for a full synonymy.

One hundred thirty-nine specimens (AMNH 59183, 20.0–37.5 mm LS) were collected at the Via River locality. They accord well with Daget's (1963) redescription of the species.

Daget (1963) noted some interpopulational variation in modal dorsal and anal fin ray counts, giving the species ranges as: D 9–13 and A 15–19. The counts for 30 of the Via River population are as follows: D 9(5)–10(25), A 16(7)–17(23). Although highly dimorphic in body proportions and anal fin shape, the two sexes were not notably different in meristic counts.

Aplocheilichthys nimbaensis is currently recorded from a series of small rivers in the mountainous regions of southeastern Upper Guinea and northeastern Liberia. It has previously been recorded from the Upper St. Paul drainage (Daget, 1963).

FAMILY ELEOTRIDAE

Kribia kribensis (Boulenger, 1907)

See Maugé (1986) for a full synonymy.

One specimen (AMNH 59063, 26.8 mm LS) was collected at the Via River locality.

Kribia kribensis, as currently recognized, is a widespread species with a range extending from Guinea to Zaire (Maugé, 1986; Harrison, 1990).

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